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Science 8

Module 2

Cells and Systems

Home Instructor's Guide and Assignment Booklet 2A

Learning Technologies Branch

Alberta LEARNING

Science 8
Module 2: Cells and Systems
Home Instructor's Guide and Assignment Booklet 2A
Learning Technologies Branch
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The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
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Home Instructors	✓
General Public	
Other	

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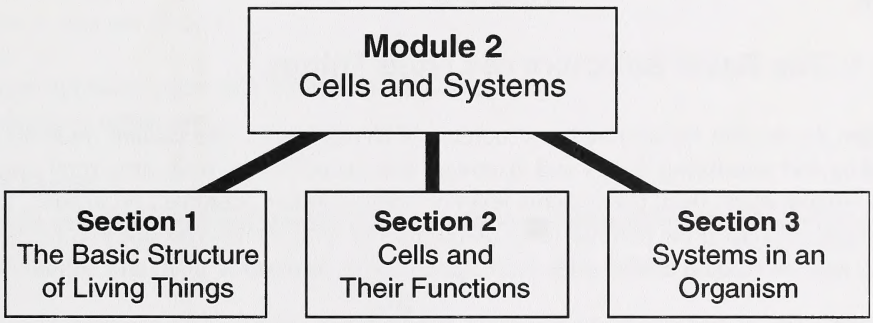
Module 2: Cells and Systems

The major emphasis of this module is the Nature of Science. This emphasis is on the processes by which scientific knowledge is developed and tested and on the nature of the scientific knowledge itself.

Living things take a variety of forms. This variety is reflected in their structures, their internal processes, and by the ways they respond to their environments. Finding patterns within this variety has led scientists to the development of ideas, such as systems, cells, structures, and functions. By using these ideas the student learns to interpret living things through levels of organization. The student investigates ways that components of a living system work together. The student discovers that the health of an organism is based not only on conditions within the organism, but also on environmental conditions.



Assessment

The assessment of this module will be based on two Assignment Booklets. These will be weighted as follows:

Assignment Booklet 2A	
Section 1 Assignment	**35 marks**
Section 2 Assignment	**30 marks**
Assignment Booklet 2B	
Section 3 Assignment	**34 marks**
Final Module Assignment	**16 marks**
TOTAL	**115 marks**

Section 1: The Basic Structure of Living Things

In this section the student focuses on the structures of living things. The student finds out the differences between living and non-living things and discovers that the cell is the basic structural unit of all living things. The student starts from the systems level of organization of complex organisms, identifies lower levels, and then ends up at the cellular level. A familiarity with the microscope and its development are encouraged, and the student also applies microscopic skills to observe plant and animal cells.

In this module, some perishable plant materials, for example, celery, must be obtained in a timely manner. Check the lists.

Safety goggles and latex gloves must be worn as a precaution while doing activities or investigations that involve the manipulation of materials and apparatus.

The following materials will be needed to complete this section.

Section 1: Lesson 1

No extra materials are needed for this lesson.

Section 1: Lesson 2

- household bottles
- various jars
- household flasks of various shapes

- a compound light microscope
- a prepared microscope slide
- hay for hay infusion and, if possible, pond water

OR

- a micro-slide viewer[1]
- micro-slide set #58: "Cell Structure"

- lens paper
- a microscope slide
- a microscope-slide cover slip
- a medicine dropper
- tweezers or just use fingers
- scissors
- a transparent plastic ruler with millimetre markings
- small pieces of newspaper

Section 1: Lesson 3

- lens paper
- a compound light microscope
- a prepared microscope slide of human skin cells
- two microscope slides
- two microscope-slide cover slips

OR

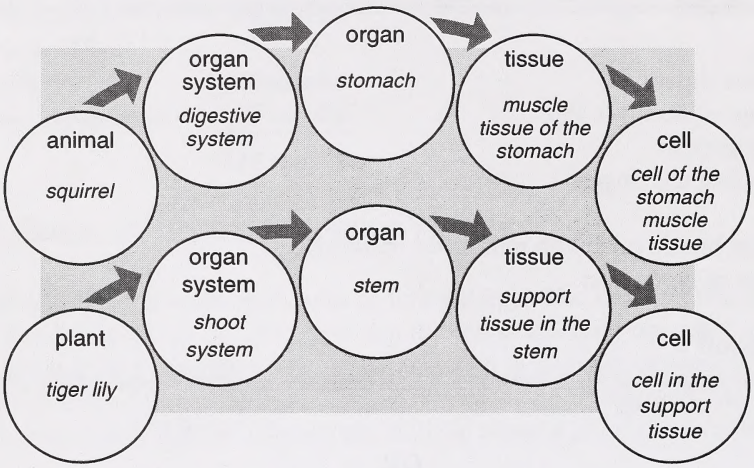
- lens paper
- a micro-slide viewer
- micro-slide set #58: "Cell Structure"
- micro-slide set #69: "The Central Nervous System"
- micro-slide set #119: "Green Plants"
- micro-slide set #222: "The Kingdom Protista"

[1] Micro-slides and viewers are from National Teaching Aids, Inc.

Suggested Answers

Section 1: Lesson 1

7. Answers will vary. A wide variety of examples are found in the textbook on pages 100 and 101. Following is one example.



8. **Textbook question 4 from "Topic 1 Review," page 102:**

   4. While a variety of arguments could be presented, the most important one is that cars are not composed of cells. Other points students could make are these:

      - Cars don't reproduce or grow.
      - Cars don't respond to the environment on their own or do anything else on their own.

Section 1: Lesson 2

1. **Textbook questions 1 and 2 from "What Did You Find Out?" on page 103:**

   1. Answers will vary depending on the containers used. The lens drawn should be thin at the edges and thick in the middle. **Comment:** A magnifying lens is also thickest in the middle.

   2. As students changed the positions of the containers, the letters should have become clearer/blurrier, bigger/smaller, upright/upside down, and distorted.

4. A simple, neat, appropriately-sized diagram of a microscope drawn in pencil—using a ruler where necessary—should be included. The parts of the compound light microscope should be identified on the diagram, which should be based on the photo on page 107 of the textbook. The diagram should have a title.

5. Refer to pages 106 and 107 of the textbook for the additional information. Did the student use a computer to make the table or a pencil and ruler to draw the table? Make good use of space? Print the information? Create a title for it?

   The following is an example of a data table.

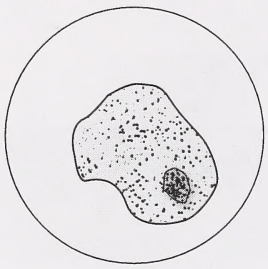
The Compound Light Microscope	
Parts	**Function**
arm	**connects tube and base and can serve as handle**
condenser lens	**directs light from light source through slide**
coarse-adjustment knob	**allows student to quickly adjust distance between objective lens and slide on stage to focus image**
diaphragm	**controls amount of light from condenser lens**
eyepiece	**provides further magnification and makes image available to eye**
fine-adjustment knob	**allows student to make fine adjustment of distance between objective lens and slide to sharpen focus obtained through coarse-adjustment lens**
light source	**provides light needed to view object in slide**
nosepiece	**holds objective lenses and allows you to rotate between lenses**
objective lenses	**produces magnified image of object held in slide**
stage	**supports slide**
tube	**maintains proper alignment and distance between eyepiece and objective lenses while keeping out surrounding light**

6. **Textbook steps 3(d) and 4 from "Procedure," pages 108 and 109:**

   3. **(d)** The image always moves in the direction opposite to the direction that the slide is moved.

   4. The sketches will vary. A sample sketch follows.

   Human Skin Cell (250X)



7. **Textbook questions 2 to 4 and 6 from "Analyze" and "Conclude and Apply," page 111:**

   2. Because of their lengths, using the coarse-adjustment knob with the medium-power or high-power objective lenses can crush the slide or damage the lenses. Therefore, students should use the coarse-adjustment knob only with low-power objective lenses.

   3. The objective lens will click into position directly over the stage opening. The magnification provided by the lens is stamped on its side.

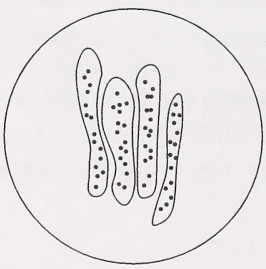
   4. When the slide is moved away from the student, the image moves toward the student.

   6. Both the lens and the slide can be easily damaged if they touch each other.

8. **Textbook step 4(a) from "Procedure," page 109:**

   4. **(a)** The sketch should look like the following.

   Scalp Bacteria (1500X)

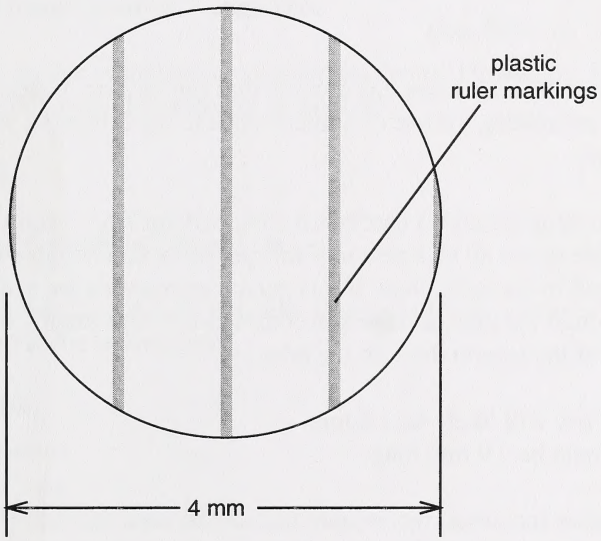


9. The slide magnification is 1500X. **Note:** This is the actual magnification seen through the eyepiece.

10. **Textbook steps from "Procedure," page 110:**

    Answers will vary. The field of view is indicated for the following image, which includes four spaces between the markings.

Field of View



The diameter of this field of view is 4 mm.

11. **Textbook questions 7 to 9 from "Conclude and Apply," page 111:**

    7. **(a)** Answers will vary. Students will multiply the eyepiece magnification by the magnification of the medium-power objective lens.

       (b) Answers will vary. Students will multiply the eyepiece magnification by the magnification of the high-power objective lens.

8. Answers will vary.

Suppose the field of view under the medium-power setting is 1.6 mm and that the objective lenses are rated as 4X, 10X, and 40X. Then the field of view

$$\text{under high power} = \text{medium-power field of view} \times \left(\frac{\text{magnification of medium-power objective lens}}{\text{magnification of high-power objective lens}} \right)$$

$$= 1.6 \text{ mm} \times \frac{10}{40}$$

$$= 0.4 \text{ mm}$$

9. As the magnification increases, the amount that can be seen decreases. This relationship can be explained by comparing the use of a microscope to the following situation that the student can easily imagine.

It's like looking through a cardboard tube, perhaps from a roll of paper towel. The student may be able to see all of a person if this person is far enough away. That's when the person is still small in the tube. Now, if this person approaches the student, the person appears ever larger through the tube as he or she comes closer. Eventually, the student will be able to see only part of the person through the tube.

12. a. The field of view will likely be 1.8 mm.
b. The object would be 0.9 mm long.

13. As the magnification increases, the amount that can be seen decreases. This relationship can be explained by comparing the situation described to another situation that the student can easily imagine.

This can be thought of as looking at part of a stretchable ruler placed at the far end of a cardboard tube. Suppose the centimetre readings were properly marked on the ruler when the ruler was unstretched. When the student looked at the unstretched ruler through the tube, the markings from the start of the scale to the 3 cm marking could be seen. Now suppose that the ruler was stretched to twice its length. This could be thought of as magnifying the scale by two. Then the student looked at the stretched ruler again. When the beginning of the scale was looked at the student would only see up to the 1.5 cm marking. This shows that increased magnification gives a smaller field of view.

15. Textbook questions 1 to 4 from "Analyze," page 113:

1. When scanning a specimen, students will use low power because it gives the biggest field of view. More of the object can be seen at one time. This makes it easier to find things. Once students have found something of interest, they will move to a higher magnification to view it more closely and, therefore, more clearly.

2. Centring an object before switching to a higher power keeps it in the field of view. Students should remember that the size of the field decreases as the magnification increases.

3. To view the letter *e* upright, students must position the slide on the stage with the *e* upside down.

4. It is likely that the student is looking at air bubbles. Gently tapping the slide cover or moving the slide cover slightly may eliminate the air bubbles.

16. Textbook question 4 from "Analyze," page 113:

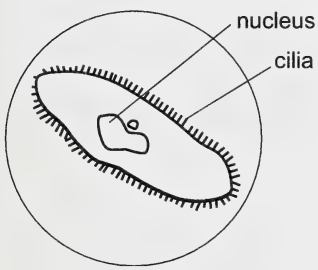
4. It is likely that the student is looking at air bubbles. Gently tapping the slide cover or moving the slide cover slightly may eliminate the air bubbles.

Section 1: Lesson 3

1. Textbook steps from "Procedure," page 116:

A sample diagram follows. The cilia are hair-like structures for movement. This allows paramecium to respond to the environment.

Paramecium (100X)



2. Textbook questions 1 to 6 from page 117:

1. The cotton fibres served two purposes:

   - They created a space between the cover slip and the slide for the larger micro-organisms to move about in.

   - They provided a contrast between living and non-living on the microscopic level.

2. Answers will vary. The presence of green chloroplasts is evidence of the ability to feed. One organism engulfing another is evidence of feeding.

3. Answers will vary. Organisms may be seen with a flagella whipping around. Under high power, cilia may be seen moving slowly. **Note:** Cilia in stentor are only for food gathering, not movement.

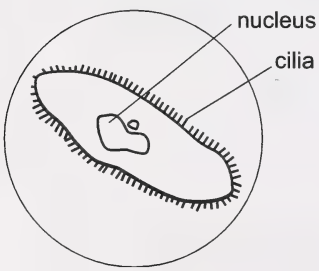
4. Answers will vary if any evidence is observed. A single cell splitting into two is evidence of reproduction. Organisms of the same type, but of different sizes, would also provide evidence of growth.

5. Like all organisms, unicellular organisms sense and respond to environmental stimuli, such as food, predators, temperature, and chemicals. If they didn't respond, they wouldn't survive.

6. Multicellular organisms are generally larger and more complex than unicellular organisms. In multicellular organisms, cells have specialized and organized to perform specific functions. However, both multicellular and unicellular organisms must carry out all life functions and have the cell as their basic unit.

3. Sketches will vary. A sample diagram follows.

Paramecium (100X)



4. **a.** They all have structures within their cells. Included are vacuoles, nuclei, and cytoplasm. Some organisms may have additional structures in common, such as cilia.

   b. Answers will vary. Cilia, the whip-like flagella, are structures that aid movement. **Note:** Cilia in stentor are only for food gathering, not movement.

   c. Answers will vary. Cilia are structures used for taking in food. The presence of green chloroplasts in a cell indicates that it produces its own food.

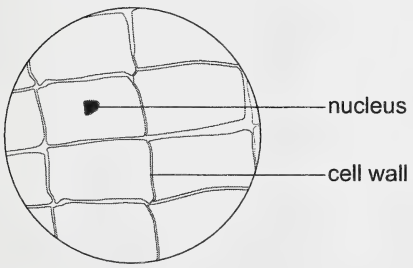
d. Multicellular organisms are generally larger and more complex than unicellular organisms. Their cells have specialized and organized to perform specific functions. However, both multicellular and unicellular organisms have the cell as their basic building block.

10. Sketches will vary. They should be like the onion skin photograph shown on page 119 of the textbook. The nucleus and cell wall should be labelled. The total magnification should be at least 100X.

11. The sketches will vary depending on the magnification power of the microscope. The sketch should look like the view on page 120 of the textbook.

13. Sketches will vary. A sample drawing follows.

Onion Skin Cells (200X)



14. Sketches will vary. A sample drawing follows.

Red Blood Cells (900X)

Section 2: Cells and Their Functions

In this section the student concentrates on the cell. The student investigates cell parts and their functions. In particular, the student explores the ways the cell membrane controls the movement of substances into and out of the cell. The student also learns about the function of specialized cells that form tissues.

The following materials will be needed to complete this section.

Section 2: Lesson 1

- a tall, narrow drinking glass or jar
- a tablespoon or a 15-mL measuring spoon
- sweetened drink powder, such as iced tea or a fruit-flavoured punch
- two uncooked eggs
- a 100-mL graduated cylinder or a measuring cup
- a spring scale and a plastic baggie or a triple-beam balance
- salt
- distilled water, if possible
- two stalks of celery with leaves attached
- red food colouring
- a sharp knife or a single-edged razor
- vinegar

Section 2: Lesson 2

No extra materials are needed for this lesson.

ASSIGNMENT BOOKLET 2A

Science 8
Module 2: Section 1 Assignment and Section 2 Assignment

Home Instructor's and Student's Comments:

STUDENT FILE NUMBER
(if label is missing or incorrect)

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Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

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- Has your work been reread to be sure the spelling and details are correct?
- Is the record form filled out and the correct module label attached?

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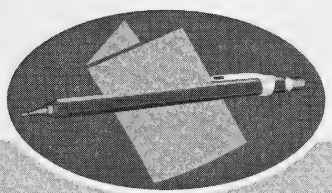
Science 8

Module 2

Cells and Systems

Assignment Booklet 2A



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FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 1 Assignment	35	
Section 2 Assignment	30	
	65	

Teacher's Comments

Science 8
Module 2: Cells and Systems
Assignment Booklet 2A
Section 1 Assignment and Section 2 Assignment
Learning Technologies Branch

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ASSIGNMENT BOOKLET 2A
SCIENCE 8: MODULE 2
SECTION 1 ASSIGNMENT AND SECTION 2 ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 65 marks out of the total 115 marks for the assignments in Module 2. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate section.

Be sure to proofread your answers carefully.

Section 1 Assignment: The Basic Structure of Living Things

35

Read all parts of your assignment carefully and record your answers in the appropriate places.

1. Name a characteristic of living things related to each of the following:

(1) **a.** a cat purrs when petted

_____

(1) **b.** a robin eats a worm

_____

(1) **c.** a plant gives off oxygen

_____

(1) **d.** a runner sweats after a race

_____

2. The cells on the surface of your skin are dead.

(2) **a.** Which characteristics of living organisms have they lost?

_____

_____

(1) **b.** Which characteristic of living organisms have they kept?

_____

_____

Circle the letter of the best response for questions 3 and 4.

(1) **3.** Which of the following is the highest level of organization?

A. cell
B. organ
C. organ system
D. tissue

(1) **4.** Which is the basic building block of life?

A. cell
B. organ
C. tissue
D. system

(2) **5.** List four different structures used by organisms to obtain or make food.

_____

_____

(1) **6.** The following structures—legs, wings, fins, scaly bellies, hooves, and flippers—all have one thing in common. What is it?

Return to page 19 of the Student Module Booklet and continue with Lesson 2.

(1) **7.** Circle the letter of the best response.

Which instrument allowed scientists to identify the basic unit of life?

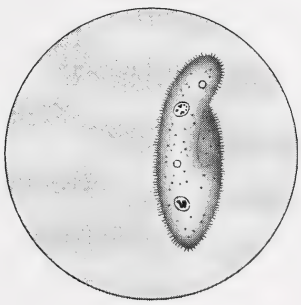
A. a magnifying glass
B. a microscope
C. a telescope
D. an electroscope

(4)

8. Match the following microscope parts on the left with a description from the right. Fill in the answer blanks to the left of the microscope parts.

_____ **a.** objective lens	A. the lens closest to the stage
_____ **b.** eyepiece	B. connects the base and tube
_____ **c.** diaphragm	C. controls the amount of light
_____ **d.** coarse-adjustment knob	D. the lens closest to the eye
	E. used to focus when using the high-power lens
	F. used to focus when using the low-power lens
	G. provides light

Use the following diagram to answer question 9.



(4)

9. The diagram shows a paramecium viewed under a microscope. The diameter of the field of view is 1.8 mm.

How long is the paramecium? Explain your answer or show your work.

(2) **10.** When you make a wet mount, you use a medicine dropper. What do you do with the medicine dropper when you prepare the slide?

_____

_____

Return to page 28 of the Student Module Booklet and continue with Lesson 3.

(5) **11.** Match the following cell organelles in the left column with their function in the right column. Fill in the answer blanks to the left of the cell organelles.

_____ **a.** mitochondria	A. converts food into energy the cell can use
_____ **b.** cell membrane	B. controls most of the activities within the cell
_____ **c.** cytoplasm	C. moves substances within the cell
_____ **d.** nucleus	D. provides protection from the environment
_____ **e.** chloroplast	E. stores food and wastes
	F. uses light energy to make food

12. Unicellular organisms and multicellular organisms have structures with similar functions.

(1) **a.** Which parts of an amoeba have similar functions to the feet of bears?

_____

(1) **b.** Which parts of a cell have similar functions to the organs of multicellular organisms?

_____

(1) **13.** In what way is a volvox significantly different from a paramecium or a stentor?

_____

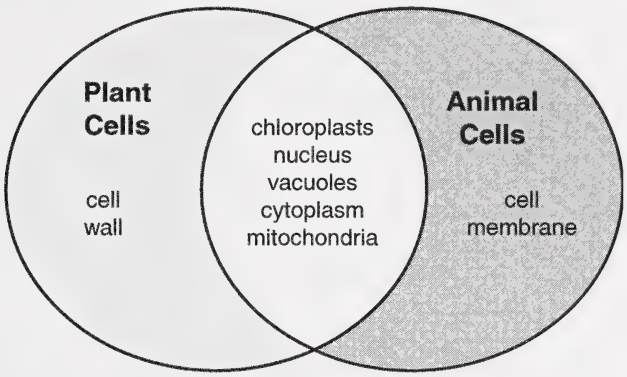
Return to page 40 of the Student Module Booklet and continue with Section 2.

14. A student made the following Venn diagram to compare plant and animal cells.

(1)

(1)

(1)



Find two terms that the student placed in the wrong position. Give reasons for your answers.

_____

_____

_____

_____

(30)

Section 2 Assignment: Cells and Their Functions

Read all parts of your assignment carefully and record your answers in the appropriate places.

Circle the letter of the best response for questions 1 and 2.

(1)

1. In an activity you allowed some drink powder to settle to the bottom of a container. After settling, the powder dissolved. The dissolved particles moved from one place to another.

Which statement describes this movement of flavour particles in the water?

A. The particles moved down to a place where their concentration was lower.
B. The particles moved down to a place where their concentration was higher.
C. The particles moved up to a place where their concentration was lower.
D. The particles moved up to a place where their concentration was higher.

(1)

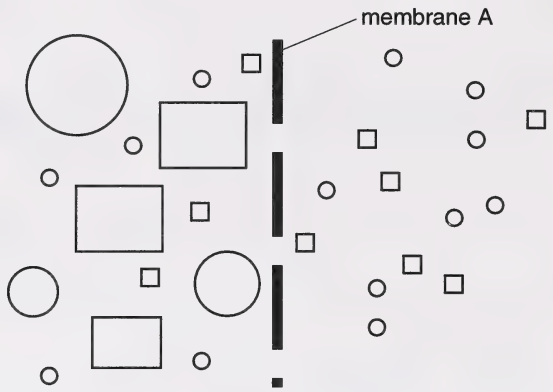
2. In an investigation you placed an egg in a saltwater solution. Water moved through the egg membrane by osmosis.

Which statement is the best inference about the movement of water?

A. Water moved into the egg to where the water concentration was less.
B. Water moved into the egg to where the water concentration was greater.
C. Water moved out of the egg to where the water concentration was less.
D. Water moved out of the egg to where the water concentration was greater.

3. Membranes can be classified as impermeable, permeable, or selectively permeable. This classification indicates how well particles are able to flow through the membranes. Use the diagrams to complete the question parts.

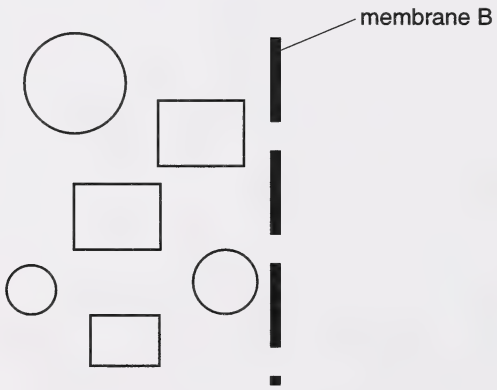
(1) **a.**



Classify membrane A in terms of how well these particles are able to flow through it.

_____

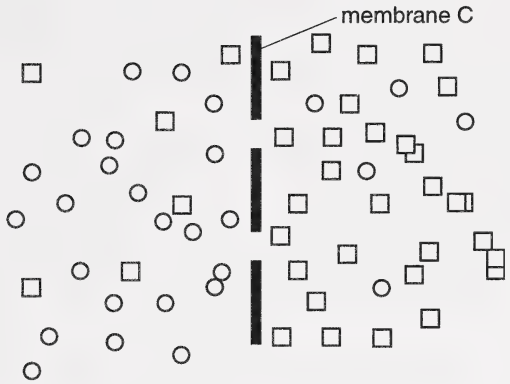
(1) **b.**



Classify membrane B in terms of how well these particles are able to flow through it.

_____

(1) **c.**



Classify membrane C in terms of how well these particles are able to flow through it.

_____

Suppose that in the diagram for 3.c., the squares represent carbon dioxide and the circles represent water.

(2) **d.** Name the process or processes by which carbon dioxide and water would cross the membrane in the diagram for 3.c.

_____

_____

(2) **e.** Refer to the diagram in 3.c. In what directions would carbon dioxide and water move? Why?

_____

_____

_____

_____

4. Tissues perform various functions in plants.

(2) **a.** Name and give the function of the vascular tissues found in plants.

_____

_____

(1) **b.** Which tissue layer is responsible for most of the food production in plants?

_____

Circle the letter of the correct response for questions 5 and 6.

(1) **5.** Which leaf cells control the opening of the stomata?

A. epidermal cells
B. guard cells
C. palisade cells
D. xylem

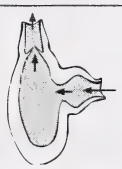
(1) **6.** Which tissue carries sugars from leaves to the rest of the plant?

A. epidermis
B. palisade
C. phloem
D. xylem

Return to page 48 of the Student Module Booklet and continue with Lesson 2.

7. Examine the information given in the following table. Then answer questions a. and b.

Structure and Function Comparisons

Animal Group	Heart Diagram	Warm/Cold Blooded	Breathing Organ(s)	Supports Own Weight	Relative Oxygen Demand
fish		cold	gills	no	very low
amphibian		cold	small lungs and skin	yes	low
reptile		cold	lungs	yes	medium
mammal		warm	lungs	yes	high

(1)

a. In moving from the top row of the table to the bottom row, what significant pattern of development is shown in the heart diagrams?

_____

(2)

b. Make a conclusion about the relationship between the complexity of the heart and the oxygen demands of the organism.

_____

_____

(1)

8. Give one reason why the cells of a multicellular organism must be specialized and organized rather than just being a large lump of undifferentiated cells?

_____

_____

(4)

9. List four main types of specialized cells in animals.

_____

_____

(4)

10. Give two examples of systems in plants. Describe the function of each system that you name.

_____

_____

_____

_____

(2)

11. A student did some research on birds and found that the bones in large birds that fly are hollow. But the aquatic, flightless penguins have solid bones.

How do you think these differences in bone structure are related to different functions?

_____

_____

_____

_____

_____

(2)

12. Match each cell with its description. Put a letter representing the description in the answer blank to the left of each cell.

Cell		Description
_____	**a.** nerve cell	A. a disk-like cell that carries oxygen
_____	**b.** red blood cell	B. a cell with long, branched fibres running from the main part of the cell
		C. a tube-like cell that carries water

Submit your completed Assignment Booklet 2A to your teacher for assessment.
Then return to page 53 of the Student Module Booklet and begin Section 3.

ASSIGNMENT BOOKLET DECLARATIONS

The Student's Declaration is to be signed by a student registered at the Alberta Distance Learning Centre. If the student is under 16, the Supervisor's Declaration is to be signed by the student's supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

_____

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